

**Amendments to the Claims**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

- 1           1.       (withdrawn): A system for evaluating cardiac performance relative  
2       to performance of an intrathoracic pressure maneuver, comprising:  
3           an implantable medical device to indirectly sense blood pressure by  
4       directly collecting intracardiac impedance measures; and  
5           an analysis component to evaluate cardiac functional changes to the blood  
6       pressure in response to performance of an intrathoracic pressure maneuver.
- 1           2.       (withdrawn): A system according to Claim 1, wherein the blood  
2       pressure comprises at least one of arterial pressure, cardiac chamber pressure,  
3       systolic pressure, and diastolic pressure.
- 1           3.       (withdrawn): A system according to Claim 2, wherein the cardiac  
2       chamber pressure comprises left ventricular end diastolic pressure.
- 1           4.       (withdrawn): A system according to Claim 1, wherein the  
2       implantable medical device comprises at least one of a bradycardia, tachycardia,  
3       heart failure, therapy delivery, and monitoring device.
- 1           5.       (withdrawn): A system according to Claim 1, further comprising:  
2       at least one lead to couple to the implantable medical device and to sense  
3       at least one of the intracardiac impedance measures across the thoracic cavity and  
4       the intracardiac impedance measures across the heart.
- 1           6.       (withdrawn): A system according to Claim 1, wherein the  
2       intrathoracic pressure maneuver comprises at least one of a Valsalva and Müller  
3       maneuver.

1           7.     (withdrawn): A system according to Claim 1, further comprising:  
2           an evaluation subcomponent to evaluate at least one of overdamping and  
3     underdamping cardiac impedance response relative to normative levels.

1           8.     (withdrawn): A system according to Claim 7, further comprising:  
2           a notification subcomponent to generate a notification responsive to the at  
3     least one of overdamping and underdamping cardiac impedance response.

1           9.     (withdrawn): A system according to Claim 1, wherein thoracic  
2     pressure is monitored during the intrathoracic pressure maneuver.

1           10.    (withdrawn): A system according to Claim 9, further comprising:  
2           an external pressure monitor to define a confined volume configured to  
3     receive a forced exhalation and to measure the thoracic pressure relative to the  
4     confined volume.

1           11.    (withdrawn): A system according to Claim 9, further comprising:  
2           a thoracic pressure sensor to internally measure thoracic pressure.

1           12.    (withdrawn): A method for evaluating cardiac performance relative  
2     to performance of an intrathoracic pressure maneuver, comprising:  
3           indirectly sensing blood pressure by directly collecting intracardiac  
4     impedance measures through an implantable medical device; and  
5           evaluating cardiac functional changes to the blood pressure in response to  
6     performance of an intrathoracic pressure maneuver.

1           13.    (withdrawn): A method according to Claim 12, wherein the blood  
2     pressure comprises at least one of arterial pressure, cardiac chamber pressure,  
3     systolic pressure, and diastolic pressure.

1           14.    (withdrawn): A method according to Claim 13, wherein the cardiac  
2     chamber pressure comprises left ventricular end diastolic pressure.

- 1           15.     (withdrawn): A method according to Claim 12, wherein the  
2     implantable medical device comprises at least one of a bradycardia, tachycardia,  
3     heart failure, therapy delivery, and monitoring device.
- 1           16.     (withdrawn): A method according to Claim 12, further comprising:  
2             sensing at least one of the intracardiac impedance measures across the  
3     thoracic cavity and the intracardiac impedance measures across the heart.
- 1           17.     (withdrawn): A method according to Claim 12, wherein the  
2     intrathoracic pressure maneuver comprises at least one of a Valsalva and Müller  
3     maneuver.
- 1           18.     (withdrawn): A method according to Claim 12, further comprising:  
2             evaluating at least one of overdamping and underdamping cardiac  
3     impedance response relative to normative levels.
- 1           19.     (withdrawn): A method according to Claim 18, further comprising:  
2             generating a notification responsive to the at least one of overdamping and  
3     underdamping cardiac impedance response.
- 1           20.     (withdrawn): A method according to Claim 12, further comprising:  
2             monitoring thoracic pressure during the intrathoracic pressure maneuver.
- 1           21.     (withdrawn): A method according to Claim 20, further comprising:  
2             defining a confined volume configured to receive a forced exhalation; and  
3             measuring the thoracic pressure relative to the confined volume.
- 1           22.     (withdrawn): A method according to Claim 20, further comprising:  
2             internally measuring thoracic pressure.
- 1           23.     (withdrawn): An apparatus for evaluating cardiac performance  
2     relative to performance of an intrathoracic pressure maneuver, comprising:

3 means for indirectly sensing blood pressure by directly collecting  
4 intracardiac impedance measures through an implantable medical device; and  
5 means for evaluating cardiac functional changes to the blood pressure in  
6 response to performance of an intrathoracic pressure maneuver.

1 24. (original): A system for assessing cardiac performance through  
2 transcardiac impedance monitoring, comprising:  
3 an implantable medical device to directly collect intracardiac impedance  
4 measures;  
5 a correlation component to correlate the intracardiac impedance measures  
6 to cardiac dimensional measures relative to performance of an intrathoracic  
7 pressure maneuver and to group the cardiac dimensional measures into at least  
8 one measures set corresponding to a temporal phase of the intrathoracic pressure  
9 maneuver; and  
10 an analysis component to evaluate the at least one cardiac dimensional  
11 measures set against a cardiac dimensional trend for the corresponding  
12 intrathoracic pressure maneuver temporal phase to represent cardiac performance.

1 25. (original): A system according to Claim 24, wherein the cardiac  
2 dimensional measures comprise at least one of cardiac stroke volume, left  
3 ventricular ejection fraction, left ventricular end diastolic dimension, and left  
4 ventricular end systolic dimension.

1 26. (original): A system according to Claim 24, further comprising:  
2 a history subcomponent to evaluate a history of cardiac performance  
3 representations; and  
4 a trending subcomponent to recognize a trend within the history indicating  
5 at least one of cardiovascular disease absence, onset, progression, regression, and  
6 status quo.

1 27. (original): A system according to Claim 24, further comprising:

2 a characteristic signature formed with the cardiac dimensional trends over  
3 the performance of the intrathoracic pressure maneuver; and  
4 a comparison subcomponent to compare an overall cardiac dimensional  
5 profile comprising the at least one cardiac dimensional measures set to the  
6 characteristic signature to form a cardiac performance assessment.

1 28. (original): A system according to Claim 27, further comprising:  
2 a predefined threshold with the comparison module to analyze the cardiac  
3 performance assessment relative to the predefined threshold.

1 29. (original): A system according to Claim 28, further comprising:  
2 a notification generated responsive to the cardiac performance assessment  
3 substantially non-complying to the predefined threshold.

1 30. (original): A system according to Claim 24, wherein the  
2 intrathoracic pressure maneuver comprises the Valsalva maneuver, further  
3 comprising:  
4 a collection subcomponent to collect the intracardiac impedance measures  
5 relative to performance of the Valsalva maneuver.

1 31. (original): A system according to Claim 30, further comprising:  
2 a phase subcomponent to specify four phases physiologically  
3 corresponding to the performance of the Valsalva maneuver, comprising defining  
4 Phase I corresponding to initial strain, defining Phase II corresponding to strain  
5 duration and cessation of breathing, defining Phase III corresponding to strain  
6 discontinuation and resumption of normal breathing, and defining Phase IV  
7 corresponding to recovery.

1 32. (original): A system according to Claim 31, further comprising:  
2 a trending subcomponent to identify an overshoot of the cardiac  
3 dimensional during the Phase IV.

1           33.     (original): A system according to Claim 32, wherein the trending  
2     subcomponent further comprises identifying an increase of the cardiac  
3     dimensional during the Phase I, identifying a transient decrease of the cardiac  
4     dimensional during the Phase II, identifying a sharp decrease of the cardiac  
5     dimensional during the Phase III, and identifying an increase preceding the  
6     overshoot and a decrease of the cardiac dimensional during the Phase IV.

1           34.     (original): A system according to Claim 24, further comprising:  
2             a programming subcomponent to provide programming support to the  
3     implantable medical device.

1           35.     (original): A system according to Claim 24, wherein the  
2     implantable medical device comprises at least one of an implantable cardiac  
3     pacemaker, implantable cardioverter defibrillator, implantable cardiac  
4     resynchronization device, implantable cardiovascular monitor, and therapeutic  
5     device monitoring and treating structural problems of the heart.

1           36.     (original): A system according to Claim 24, further comprising:  
2             a database to maintain the intracardiac impedance measures.

1           37.     (original): A system according to Claim 24, wherein the  
2     intrathoracic pressure maneuver comprises at least one of the Valsalva maneuver  
3     and Müller maneuver.

1           38.     (original): A method for assessing cardiac performance through  
2     transcardiac impedance monitoring, comprising:  
3             directly collecting intracardiac impedance measures through an  
4     implantable medical device;  
5             correlating the intracardiac impedance measures to cardiac dimensional  
6     measures relative to performance of an intrathoracic pressure maneuver;  
7             grouping the cardiac dimensional measures into at least one measures set  
8     corresponding to a temporal phase of the intrathoracic pressure maneuver; and

9           evaluating the at least one cardiac dimensional measures set against a  
10       cardiac dimensional trend for the corresponding intrathoracic pressure maneuver  
11       temporal phase to represent cardiac performance.

1           39.       (original): A method according to Claim 38, wherein the cardiac  
2       dimensional measures comprise at least one of cardiac stroke volume, left  
3       ventricular ejection fraction, left ventricular end diastolic dimension, and left  
4       ventricular end systolic dimension.

1           40.       (original): A method according to Claim 38, further comprising:  
2       evaluating a history of cardiac performance representations; and  
3       recognizing a trend within the history indicating at least one of  
4       cardiovascular disease absence, onset, progression, regression, and status quo.

1           41.       (original): A method according to Claim 38, further comprising:  
2       forming a characteristic signature with the cardiac dimensional trends over  
3       the performance of the intrathoracic pressure maneuver; and  
4       comparing an overall cardiac dimensional profile comprising the at least  
5       one cardiac dimensional measures set to the characteristic signature to form a  
6       cardiac performance assessment.

1           42.       (original): A method according to Claim 41, further comprising:  
2       analyzing the cardiac performance assessment relative to a predefined  
3       threshold.

1           43.       (original): A method according to Claim 42, further comprising:  
2       generating a notification responsive to the cardiac performance assessment  
3       substantially non-complying to the predefined threshold.

1           44.       (original): A method according to Claim 38, wherein the  
2       intrathoracic pressure maneuver comprises the Valsalva maneuver, further  
3       comprising:

4           collecting the intracardiac impedance measures relative to performance of  
5   the Valsalva maneuver.

1           45.   (original): A method according to Claim 44, further comprising:  
2           specifying four phases physiologically corresponding to the performance  
3   of the Valsalva maneuver, comprising:  
4           defining Phase I corresponding to initial strain;  
5           defining Phase II corresponding to strain duration and cessation of  
6   breathing;  
7           defining Phase III corresponding to strain discontinuation and  
8   resumption of normal breathing; and  
9           defining Phase IV corresponding to recovery.

1           46.   (original): A method according to Claim 45, further comprising:  
2           identifying an overshoot of the cardiac dimensional during the Phase IV.

1           47.   (original): A method according to Claim 46, further comprising:  
2           identifying an increase of the cardiac dimensional during the Phase I;  
3           identifying a transient decrease of the cardiac dimensional during the  
4   Phase II;  
5           identifying a sharp decrease of the cardiac dimensional during the Phase  
6   III; and  
7           identifying an increase preceding the overshoot and a decrease of the  
8   cardiac dimensional during the Phase IV.

1           48.   (original): A method according to Claim 38, further comprising:  
2           providing programming support to the implantable medical device.

1           49.   (original): A method according to Claim 38, wherein the  
2   implantable medical device comprises at least one of an implantable cardiac  
3   pacemaker, implantable cardioverter defibrillator, implantable cardiac  
4   resynchronization device, implantable cardiovascular monitor, and therapeutic  
5   device monitoring and treating structural problems of the heart.



1           50.     (original): A method according to Claim 38, further comprising:  
2           maintaining the intracardiac impedance measures in a database.

1           51.     (original): A method according to Claim 38, wherein the  
2           intrathoracic pressure maneuver comprises at least one of the Valsalva maneuver  
3           and Müller maneuver.

1           52.     (original): An apparatus for assessing cardiac performance through  
2           transcardiac impedance monitoring, comprising:  
3           means for directly collecting intracardiac impedance measures through an  
4           implantable medical device;  
5           means for correlating the intracardiac impedance measures to cardiac  
6           dimensional measures relative to performance of an intrathoracic pressure  
7           maneuver;  
8           means for grouping the cardiac dimensional measures into at least one  
9           measures set corresponding to a temporal phase of the intrathoracic pressure  
10          maneuver; and  
11          means for evaluating the at least one cardiac dimensional measures set  
12          against a cardiac dimensional trend for the corresponding intrathoracic pressure  
13          maneuver temporal phase to represent cardiac performance.